Budget impact analysis of rapid screening for Staphylococcus aureus colonization among patients undergoing elective surgery in US hospitals


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The objective was to carry out a budget impact analysis of performing rapid testing for Staphylococcus aureus colonization before admission for all in-patients scheduled to undergo elective surgery. The authors concluded that adding pre-admission testing and decolonisation therapy to the standard care led to significant cost savings and lower in-hospital deaths. The methodology was transparent and valid, especially for the cost analysis. The authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to carry out a budget impact analysis of performing rapid testing for Staphylococcus aureus (S. aureus) colonization, before admission, for all in-patients scheduled to undergo elective surgery. Evaluating the clinical impact of this strategy was a secondary aim.

Interventions
The intervention was a strategy of rapid testing for S. aureus colonization, before admission, for all in-patients scheduled to undergo elective surgery, with subsequent decolonisation therapy for those patients found to be colonised. The comparator was the standard care, which did not include pre-admission testing and decolonisation therapy.

Location/setting
USA/hospital.

Methods
Analytical approach:
This economic evaluation was based on a decision analytic model reviewed by a four-member expert panel. The time horizon was restricted to the duration of the hospital stay. The authors stated that the perspective of the hospital was adopted.

Effectiveness data:
The clinical data came from a selection of known, relevant studies. The epidemiological data were derived from the 2003 Nationwide Inpatient Sample (NIS), which was the largest all-payer in-patient care database in the USA. The test accuracy data came from personal communication and unpublished data. Other estimates came from published studies, the details of which were not provided, supplemented by expert opinions. The key clinical inputs were test accuracy and efficacy of decolonisation therapy.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
No summary benefit measure was used. The primary clinical endpoint was the number of deaths avoided.

Cost data:
The economic analysis included the costs of the rapid diagnostic test, nursing time to obtain a nasal swab, decolonisation treatment, and hospital stay. The cost of decolonisation treatment was based on the average wholesale prices. The cost of the diagnostic test was based on authors' assumptions. The nursing average earnings came from the US Department of Labor, while the hospital costs were derived from the NIS. All costs were in US dollars ($) and the price year was 2004. A cost-to-charge ratio was applied to estimate the true cost of the two strategies.

Analysis of uncertainty:
A probabilistic sensitivity analysis was undertaken to investigate the uncertainty simultaneously for all the model inputs, using a second-order simulation. A probability distribution was assigned to each model input and confidence intervals were generated for the model outputs. Furthermore, this approach provided correlation coefficients for each input with respect to the model outcomes.

Results
Considering the total number of admissions for elective surgical procedures in US hospitals in 2003 (7,181,484 patients), the implementation of the pre-admission testing strategy saved $231,538,400 (95% confidence interval, CI: 299,786,016 to 1,330,255,360), avoided 364,919 patient-days (95% CI: 67,893 to 926,983), and avoided 935 deaths per year (95% CI: 88 to 3,691), in comparison with standard care. It was, therefore, a dominant strategy, as it was less costly and more effective.

The correlation analysis revealed that the most influential model input was the efficacy of decolonisation therapy.

The acceptability curve showed that the probability that the pre-admission testing strategy was cost-saving was 65%.

Authors' conclusions
The authors concluded that adding pre-admission testing and decolonisation therapy to standard care led to significant cost savings and fewer in-hospital deaths.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. The proposed strategy was compared with usual practice in the authors' setting. The model considered advanced rapid diagnostic testing, and the findings are not transferable to less advanced testing strategies with longer turnaround times.

Effectiveness/benefits:
The sources of data were selected. The use of a large administrative database had the advantage of reflecting real-world experience, although the data were gathered for the purpose of this analysis. The authors did not provide a description of the design or other characteristics of the studies used to derive the clinical data, except for the NIS database. The selection of the best point estimate among those available from the literature was based on expert opinion, but alternative estimates were considered in the sensitivity analysis. Death was considered as a clinical outcome, but this analysis was a secondary objective.

Costs:
This evaluation focused on the economic impact of the two strategies. The analysis of costs was consistent with the perspective, and all the relevant cost categories appear to have been included. The details of the unit costs, quantities of resources, sources of data, price year, and use of statistical analyses were reported extensively, which enhances the transparency of the economic analysis.

Analysis and results:
The costs and benefits were not synthesised. The issue of uncertainty was satisfactorily addressed and the results of the sensitivity analyses were clearly presented and discussed. Statistical analyses were performed in order to control for fixed hospital effects and for patient characteristics. The decision model was clearly presented. The authors noted some potential limitations of their analysis such as the use of a national perspective for the study (which might not reflect the cost-savings for individual providers) or the inclusion of all strains of S. aureus (rather than specific strains, which might impose a greater burden to the health care system). Finally, the model considered colonisation in the nose and not
at any other body sites.

**Concluding remarks:**
The methodology was transparent and valid, especially for the cost analysis. The authors' conclusions appear to be valid.

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